

REFUTATION OF PALM'S AND MACANDREW'S

"TOP GEOCENTRIST FAILS PIONEER CHALLENGE"¹

AUGUST 2018

Palm: Those who have not spent much time critically reading the works of Robert Sungenis on strict Geocentrism may be unaware of how often he resorts to debater's tricks when responding to his opponents. One of his favorites is misdirection. In many instances he appears to give a fulsome answer, but a closer look shows that he's failed to engage his opponent's argument at all. His frequent *modus operandi* is to overwhelm the reader with copious but irrelevant verbiage, in the hopes that the reader will confuse quantity of words with intellectual substance. One example is in his non-answer to the challenge posed by Dr. Alec MacAndrew concerning the Pioneer 10 and 11 spacecraft. Dr. MacAndrew's challenge is reproduced below from his article "[Here Comes the Sun: How the new geocentrists persist in scientific and logical errors](#)" (well worth reading in its entirety.)

R. Sungenis: Palm has a penchant of claiming that neither I nor my partner, Rick Delano, has either answered his challenges or that we refuse to follow-up on Palm's successive challenges. The fact is, Palm deliberately refuses to send me his challenges or re-challenges, and thus most of the time I don't know they exist. Take, for example, this present challenge. Palm posted it in March 2018, exactly five months ago, but I didn't hear about it until, by happenstance, I came across the website of Steve Ray a few days ago (August 2018). A few days ago I sent an email to Palm and told him to stop the cat and mouse game and forward his articles to me directly so that I can answer them forthwith, but he refused. I also asked him if he was interested in a friendly dialogue with me about these issues that we could publicize, and, if not, I asked him if he would post my rebuttals to his articles on his website so that all involved could see both sides of the story. He refused both requests. Normally, I would ignore such obstinacy, but I feel obligated to you, the public and my dear patrons, to answer any challenge he brings forth.

In this one you will see both Palm and MacAndrew totally fail, once again, to make a convincing argument. In fact, their paper is so bad I wonder how they would even tout this specious effort as a definitive case against geocentrism. It just shows how desperate they are. At one point the very article they use to support their contentions is the very article that contradicts and refutes them. Either they didn't read the article, or, if they did read it, they didn't comprehend what the author actually said. This is not the first

¹ Posted on March 30, 2018 by David Palm.

time they have done this. Their previous paper on Stellar Aberration presents a paper written by Eisner and it actually refutes their position.

So, bear with me as I show the flaws in their present paper.

Palm: What MacAndrew asks of the geocentrists – his challenge regarding Pioneer – is very specific:

MacAndrew: Although it is true that within [General Relativity], *local* experiments cannot distinguish between various manifestations of acceleration and gravity, it is wrong to say that one cannot make reasonable inferences based on non-local observations and on considerations rooted in causation (as we did for the annual Doppler shift modulation of the CMB and quasars above).

R. Sungenis: Well, if MacAndrew is going to use “annual Doppler shift modulation of the CMB and quasars,” as an example of how to interpret “non-local observations,” then MacAndrew has lost the debate right out of the starting gate. This very question of how to interpret the Doppler shift of the CMB came up in a recent debate I had with Palm on the Michelson-Morley experiment. In that debate Palm insisted:

Palm: (And it’s not just motions of physical objects that have to added to the geocentric model. The CMB displays an annual Doppler shift when viewed from the Earth. This would be expected according to normal orbital mechanics, but would not be expected in a geocentric model and requires additional “motion” of the entire CMB to explain it. Dr. MacAndrew has a good presentation of this in “Here Comes the Sun”, pp. 10-11.). So no, I strongly disagree with the argument that your model is simpler. I stand by my characterization of it as an exercise in special pleading, that it is not reasonable to abandon a parsimonious explanation in favor of such ad hoc explanations and special pleading, and that it’s completely unnecessary since it isn’t a matter of divine faith.

R. Sungenis: Glad you brought this up, because it’s one of the best demonstrations we have of a fixed Earth. What you don’t seem to be aware of is that the CMB anisotropy is only one annual Doppler shift we have measured for the Dipole. There are at least two others and neither of them provide the presumed speed of the solar system through the galaxy that your system has adopted, and one of them is four times higher than that presumed speed.² So that

² Big Bang cosmology claims that the dipole axis is created by the sun-earth system moving through the CMB, which creates a Doppler blue shift. But how does Big Bang cosmology then explain the quadrupole/octupole axis, which is very near to the dipole axis? It cannot be created by a movement of the sun-earth system through the CMB since, obviously, the sun-earth system cannot be going in one direction to create the dipole and, at the same time, going in another direction to create the quadrupole and octupole. Something is definitely amiss here. A recent paper by Kothari, *et al*, shows that attributing

means you have a real problem, since there are multiple Doppler shifts hitting the Earth at different speeds, but in your heliocentric system they should be all one speed, namely, the speed of the Earth through the fixed radiation. The only way to get two, three or more speeds is if there are various sources for the dipole anisotropy that are moving against a fixed Earth.

But we will be kind and move on to what else MacAndrew has to say:

MacAndrew: Is there any such evidence for the Earth's daily rotation? Let's look at Pioneer 10 and 11, two spacecraft that were launched in 1972 and 1973 respectively, to study the asteroid belt, Jupiter and Saturn. After completing their mission they continued on their trajectory out of the solar system at well above escape velocity. Pioneer 10 remained in contact with earth stations until 2003 when it was some 12 billion kilometres away. You will remember that the Sun has by far the biggest gravitational field in the solar system and for that reason both Pioneers were slowed down by the Sun's gravity as they flew away from the solar system. However measurements of the spacecraft position and speed indicated that both Pioneers were slowing down more than the models predicted and for several years this effect, known as the Pioneer anomaly, was a mystery. All we need to know about the anomaly is a) that it was tiny ($\sim 10^{-10} \text{ ms}^{-2}$ – a hundred billionth of the acceleration due to gravity at the Earth's surface) and b) that it has been explained with perfectly conventional physics [Turyshv, Slava G., et al. "[*Support for the thermal origin of the Pioneer anomaly.*](#)" Physical review letters 108.24 (2012): 241101].

R. Sungeis: At the risk of being accused of "copious but irrelevant verbiage," first allow me to quote from the very paper that MacAndrew cites above. Notice the title says

the dipole to the presumed motion of the solar system through the CMB does not match the CMB data. They first report a paper by Singal (2011) showing an apparent solar velocity of 1600 km/sec, which is about four times higher than the previously accepted 369 km/sec, and which "suggests a potential violation of the cosmological principle" and thus "the Universe may be intrinsically anisotropic with the preferred axis approximately in the direction of the CMBR dipole." With additional research, they conclude "the data is not consistent with the CMBR dipole. It clearly indicates the presence of an intrinsic dipole anisotropy which cannot be explained in terms of local motion," which result is confirmed at a "4 – 5 sigma" level. This leads them to the conclusion that the "anisotropy we observe may have a physical origin." ("Dipole anisotropy in flux density and source count distribution in radio NVSS data," R. Kothari, A. Naskar, P. Tiwari, S Nadkarni-Ghosh and P. Jain, July 8, 2013, Dept. of Physics, Indian Institute of Technology, Kanpur, India, at arXiv:1307.1947v1). The concluding sentence of the paper states: "Finally, assuming the presence of an intrinsic dipole contribution in the source counts, we separate it out from the kinematic dipole. The resulting speed of the solar system, however, is still found to be higher than the CMBR expectation. Our results support the hypothesis that the Universe is intrinsically anisotropic with the anisotropy axis pointing towards Virgo" (p. 10). Ralston may have made the same point when he says, "However the alignment of the quadrupole and octupole happens to be right along the dipole, and point along Virgo. Some use this as a reason to dismiss the quadrupole and octupole, while retaining the rest of the CMB as 'pristine.'"

“Support for” and not “Proof for” or anything definitive, yet MacAndrew says the Pioneer anomaly “has been explained with perfectly conventional physics.” Let’s see what the authors themselves say from the above paper, “Support for the thermal origin of the Pioneer anomaly”:

Currently, we find no mechanism or theory that explains the anomalous acceleration. What we can say with some confidence is that the anomalous acceleration is a line of sight constant acceleration of the spacecraft toward the Sun [73]. Even though fits to the Pioneers appear to match the noise level of the data, in reality the fit levels are as much as 50 times above the fundamental noise limit of the data. Until more is known, we must admit that the most likely cause of this effect is an unknown systematic. (We ourselves are divided as to whether “gas leaks” or “heat” is this “most likely cause.”) (p. 47).

Obviously not even the team itself agrees on what the cause of the “anomalous acceleration” is, some thinking that it is a “gas leak” (in accord with their statement on pp. 16-17: “This [$7.03 \times 10^{-8} \text{ cm/s}^2$] is close to the magnitude of the anomalous acceleration inferred from the Doppler data, but in the opposite direction. However the gas leak rapidly decays and becomes negligible after 20 days or so”); and others attribute it to “heat,” which are two vastly different causes. But even then, the “heat” advocates qualify their guess with...

It is hard to resist the notion that this heat somehow must be the origin of the effect. However, iii) there is no solid explanation in hand as to how a specific heat mechanism could work. Further, iv) the decrease in the heat supply over time should have been seen by now. Further experiment and analysis is obviously needed to resolve this problem. (p. 47).

They further add that the anomalous acceleration from the Doppler data registering at $\sim (8.7 \pm 1.3) \times 10^{-8} \text{ cm/s}^2$ is still one order of magnitude off (that is, 10 times off) what the “heat” hypothesis is yielding for them:

Our investigation has emphasized that effects that previously thought to be insignificant, such as rejected thermal radiation or mass expulsion, are now within (or near) one order of magnitude of possible mission requirements. (p. 47).

The one order of magnitude probably comes from their estimate of what the heat issue might produce, namely, “The largest bias/uncertainty is from RTG heat reflecting off the spacecraft. We argued for an effect as large as $(-0.55 \pm 0.55) \times 10^{-8} \text{ cm/s}^2$The effect is clearly significant and remains to be explained” (p. 42-43), which is one order lower than $\sim (8.7 \pm 1.3) \times 10^{-8} \text{ cm/s}^2$.

So, with this kind of guesswork and inexactness being employed for the cause of the Pioneer anomaly, are Rick and I under any obligation to answer the present challenge from Palm and MacAndrew?

Before we answer that question, let's see what other issues might be competing with the "heat" explanation for Pioneer 10. In their paper, Anderson, Liang, *et al*, are honest enough to tell us all the other proposals that have been suggested for the Pioneer problem. The list of alternatives reads like a smorgasbord of modern physics theories, and I have left out about a half-dozen of them:

- In particular, Crawford [126] suggested a novel new effect: a gravitational frequency shift of the radio signals that is proportional to the distance to the spacecraft and the density of dust in the intermediate medium. (p. 44).
- It is interesting to speculate on the unlikely possibility that the origin of the anomalous signal is new physics [129]. This is true even though the probability is that some "standard physics" or some as-yet-unknown systematic will be found to explain this "acceleration." (p. 44)
- It is also of interest to consider some of the recent proposals to modify gravity, as alternatives to dark matter [132]-[135]. Consider Milgrom's proposed modification of gravity [135], where the gravitational acceleration of a massive body is a $\propto 1/r^2$ for some constant $a_0 \ll a$ and $a \propto 1/r$ for $a_0 \gg a$. Depending on the value of H , the Hubble constant, $a_0 \approx a_P$! Indeed, as a number of people have noted, $a_H = cH \rightarrow 8 \times 10^{-8} \text{ cm/s}^2$, (57) if $H = 82 \text{ km/s/Mpc}$. (p. 44).
- For example, Rosales and S'anchez-Gomez [142] propose that a_P is due to a local curvature in light geodesics in the expanding spacetime universe. They argue that the Pioneer effect represents a new cosmological Foucault experiment, since the solar system coordinates are not true inertial coordinates with respect to the expansion of the universe. Therefore, the Pioneers are mimicking the role that the rotating Earth plays in Foucault's experiment. (p. 45).
- From a similar viewpoint, Guruprasad [143] finds accommodation for the constant term while trying to explain the annual term as a tidal effect on the physical structure of the spacecraft itself. In particular, he suggests that the deformations of the physical structure of the spacecraft (due to external factors such as the effective solar and galactic tidal forces) combined with the spin of the spacecraft are directly responsible for the detected annual anomaly. Moreover, he proposes a hypothesis of the planetary Hubble's flow and suggests that Pioneer's anomaly does not contradict the existing planetary data, but supports his new theory of relativistically elastic space-time. (p. 45).
- Østvang [144] further exploits the fact that the gravitational field of the solar system is not static with respect to the cosmic expansion. (p. 45).
- Belayev [145] considers a Kaluza-Klein model in 5 dimensions with a time-varying scale factor for the compactified fifth dimension. His comprehensive analysis led to the conclusion that a variation of the physical constants on a cosmic time scale is responsible

for the appearance of the anomalous acceleration observed in the Pioneer 10/11 tracking data. (p. 45).

- Modanese [146] considers the effect of a scaledependent cosmological term in the gravitational action. (p. 45).
- Mansouri, Nasserri and Khorrami [147] argue that there is an effective time variation in the Newtonian gravitational constant that in turn may be related to the anomaly. In particular, they consider the time evolution of G in a model universe with variable space dimensions. (p. 45).
- Inavov [149] suggests that the Pioneer anomaly is possibly the manifestation of a superstrong interaction of photons with single gravitons that form a dynamical background in the solar system. Every gravitating body would experience a deceleration effect from such a background with a magnitude proportional to Hubble’s constant. Such a deceleration would produce an observable effect on a solar system scale. (p. 45).
- All these ideas produce predictions that are close to Eq. (57), but they certainly must be judged against discussions in the following two subsections. (p. 45). In a different framework, Foot and Volkas [150], suggest the anomaly can be explained if there is mirror matter or mirror dust in the solar system. this could produce a drag force and not violate solar-system mass constraints. (p. 45).
- Several scalar-field ideas have also appeared. Mbelek and Lachi`eze-Rey [151] have a model based on a longrange scalar field, which also predicts an oscillatory decline in a_P beyond about 100 AU. This model does explain the fact that a_P stays approximately constant for a long period (recall that Pioneer 10 is now past 70 AU). (p. 45).
- From a similar standpoint Calchi Novati et al. [152] discuss a weak-limit, scalar-tensor extension to the standard gravitational model. (p. 45).
- Consoli and Siringo [154] and Consoli [155] consider the Newtonian regime of gravity to be the long wavelength excitation of a scalar condensate from electroweak symmetry breaking. They speculate that the self-interactions of the condensate could be the origins of both Milgrom’s inertia modification [132, 135] and also of the Pioneer effect. (pp. 45-46).
- Capozziello and Lambiase [156] argue that flavor oscillations of neutrinos in the Brans-Dicke theory of gravity may produce a quantum mechanical phase shift of neutrinos. Such a shift would produce observable effects on astrophysical/cosmological length and time scales. In particular, it results in a variation of the Newtonian gravitational constant and, in the low energy limit, might be relevant to our study. (p. 46).
- Motivated by the work of Mannheim [133, 157], Wood and Moreau [158] investigated the theory of conformal gravity with dynamical mass generation. They argue that the Higgs scalar is a feature of the theory that cannot be ignored. In particular, within this framework they find one can reproduce the standard gravitational dynamics and tests within the solar system, and yet the Higgs fields may leave room for the Pioneer effect on small bodies. (p. 46).

The authors of “Support for the thermal origin of the Pioneer anomaly” can hardly argue against many of these proposals because, as they themselves admit on page 9: “Doppler measurements provide the ‘range rate’ of the spacecraft and therefore are affected by *all*

the dynamical phenomena [gravity or inertial forces] in the volume between the Earth and the spacecraft.”

Finally, the authors add this loaded statement:

In summary, as highly speculative as all these ideas are, it can be seen that at the least the Pioneer anomaly is influencing the phenomenological discussion of modern gravitational physics and quantum cosmology [159]. (p. 46).

That is quite an understatement. With about two-dozen theories noted above on how the universe operates, it essentially shows (excuse my French) that nobody knows what the hell they are doing! In effect, in order to save face for modern science by trying to confine the Pioneer problem to something as simple as a gas leak or a heat effect, they end up showing how ignorant the rest of modern science is on how the universe at large works. The Pioneer issue was merely the straw that broke the camel’s back in revealing the much bigger problem in modern cosmology.

To add to the confusion, the authors say this:

It is important to realize that our experimental observable is a Doppler frequency shift, i.e., $\Delta\nu(t)$. [See Figure 8 and Eq. (15).] In actual fact it is a cycle count. We interpret this as an apparent acceleration experienced by the spacecraft. However, it is possible that the Pioneer effect is not due to a real acceleration. (See Section XI.) Therefore, the question arises “In what units should we report our errors?” The best choice is not clear at this point. For reasons of clarity we chose units of acceleration. (p. 42).

So these men are not even sure that their Doppler shifts are really caused by acceleration. They only chose units of acceleration “for reasons of clarity,” whatever that means.

So, let’s ask the question again. Are Rick and I obligated to answer this present challenge concerning Pioneer 10’s anomalous acceleration considering that not even the authors of the paper Palm and MacAndrew use agree on their proposed solution; or that there are at least 100 variables³ to consider—if they want to do it right—to narrow the answer down to even a gas leak or a heat problem; or that we are now aware of at least two-dozen alternatives others have used to answer the anomaly?

The answer is no. We are under no obligation.

³ “There are several alternate expressions that have up to several hundred additional periodic terms which provide greater accuracies than Eq. (6)” p. 13.

That Palm and MacAndrew would even propose such a cockamamie situation as a challenge to geocentric cosmology shows how desperate they are. In the past they have tried to portray modern science as some grand monolithic consensus of belief that is all presented in neat tidy packages. What we have seen from my above analysis that it is anything BUT a monolith.

But even though we aren't obligated, we are going to answer it in any case, and with the very parameters that Palm and MacAndrew have stipulated. So let's first paste the title and the abstract here:

Support for the thermal origin of the Pioneer anomaly

Slava G. Turyshev, Viktor T. Toth, Gary Kinsella, Siu-Chun Lee, Shing M. Lok, Jordan Ellis

(Submitted on 11 Apr 2012)

We investigate the possibility that the anomalous acceleration of the Pioneer 10 and 11 spacecraft is due to the recoil force associated with an anisotropic emission of thermal radiation off the vehicles. To this end, relying on the project and spacecraft design documentation, we constructed a comprehensive finite-element thermal model of the two spacecraft. Then, we numerically solve thermal conduction and radiation equations using the actual flight telemetry as boundary conditions. We use the results of this model to evaluate the effect of the thermal recoil force on the Pioneer 10 spacecraft at various heliocentric distances. We found that the magnitude, temporal behavior, and direction of the resulting thermal acceleration are all similar to the properties of the observed anomaly. As a novel element of our investigation, we develop a parameterized model for the thermal recoil force and estimate the coefficients of this model independently from navigational Doppler data. We find no statistically significant difference between the two estimates and conclude that once the thermal recoil force is properly accounted for, no anomalous acceleration remains.

The first thing I want you to notice is that the anomalous acceleration of Pioneer 10 is said to be caused by a recoil due to an emission of thermal radiation from the spacecraft.

MacAndrew: What is relevant to us is the fact that the anomaly was so small and therefore, in order to measure it, physicists needed to know the position (range and direction) of the satellites with extreme precision. These measurements are made by Doppler measurements and timing of radio signals sent to the satellites and returned to Earth ground stations. There is a daily modulation of the Doppler signals caused by the fact that Earth's rotation causes a daily change in the relative velocity between the spacecraft and the Earth which physicists must correct for. In fact this daily Doppler

modulation is used to measure the direction of the spacecraft from the Earth (its amplitude gives declination and its phase gives right ascension).

R. Sungenis: It is no surprise that the authors of “Support for the thermal origin of the Pioneer anomaly,” being heliocentrists, are going to try to answer the problem from the perspective of a rotating Earth, not a rotating universe, which is why they say the following:

3. Inferring position information from Doppler It is also possible to infer the position in the sky of a spacecraft from the Doppler data. This is accomplished by examining the diurnal variation imparted to the Doppler shift by the Earth’s rotation. As the ground station rotates underneath a spacecraft, the Doppler shift is modulated by a sinusoid. The sinusoid’s amplitude depends on the declination angle of the spacecraft and its phase depends upon the right ascension. These angles can therefore be estimated from a record of the Doppler shift that is (at least) of several days duration. This allows for a determination of the distance to the spacecraft through the dynamics of spacecraft motion using standard orbit theory contained in the orbit determination programs. (p. 10).

As seen in Figure 18, there is a significant diurnal term in the Doppler residuals, with period approximately equal to the Earth’s sidereal rotation period (23h 56m 04s.0989 mean solar time). (p. 41).

After the removal of this diurnal term, the RMS Doppler residuals are reduced to amplitude 0.054 mm/s for $T_c = 660$ s ($\sigma_{\dot{v}} / v = 2.9 \times 10^{-13}$ at $T_c = 1000$ s). (p. 41)

The same “daily modulation of the Doppler signals” will be caused by a daily rotating universe against a fixed Earth since it will cause “a daily change in the relative velocity between the spacecraft and the Earth which physicists must correct for.” (p. 41).

Such a modeling problem arises when there are errors in any of the parameters of the spacecraft orientation with respect to the chosen reference frame. Because of these errors, the system of equations that describes the spacecraft’s motion in this reference frame is under-determined and its solution requires non-linear estimation techniques. In addition, the whole estimation process is subject to Kalman filtering and smoothing methods. Therefore, if there are modeling errors in the Earth’s ephemeris, the orientation of the Earth’s spin axis (precession and nutation), or in the station coordinates (polar motion and length of day variations), the least-squares process (which determines best-fit values of the three direction cosines) will leave small diurnal and annual components in the Doppler residuals, like those seen in Figures 17-18. (p. 41)

MacAndrew: But there’s more – because the Pioneer anomaly was so small, perturbations in the Earth’s daily rotation and in the velocity of the ground stations

were significant and had to be taken into account. Corrections were made for: Earth's precession, nutation, polar motion, tides, the Moon's, Sun's and planets' gravitational torque, Earth's mantle elasticity, Earth flattening, structure and properties of the core-mantle boundary, rheology of the core, underground water, oceanic variability, atmospheric variability, evolution of Earth's shape, and the location of Earth's centre of mass relative to the crust [see [here](#).]

R. Sungenis: For the record, the paragraphs in the paper from which MacAndrew quotes these items are the following:

Time in any scale is represented as seconds past 1 January 2000, 12h, in that time scale. This epoch is J2000.0, which is the start of the Julian year 2000. The Julian Date for this epoch is JD 245,1545.0. Our analyses used the standard space-fixed J2000 coordinate system, which is provided by the International Celestial Reference Frame (ICRF). This is a quasi-inertial reference frame defined from the radio positions of 212 extragalactic sources distributed over the entire sky [56].

The variability of the earth-rotation vector relative to the body of the planet or in inertial space is caused by the gravitational torque exerted by the Moon, Sun and planets, displacements of matter in different parts of the planet and other excitation mechanisms. The observed oscillations can be interpreted in terms of mantle elasticity, earth flattening, structure and properties of the core-mantle boundary, rheology of the core, underground water, oceanic variability, and atmospheric variability on time scales of weather or climate.

Several space geodesy techniques contribute to the continuous monitoring of the Earth's rotation by the International Earth Rotation Service (IERS). Measurements of the Earth's rotation presented in the form of time developments of the so-called Earth Orientation Parameters (EOP). Universal time (UT₁), polar motion, and the celestial motion of the pole (precession/nutation) are determined by Very Long-Baseline Interferometry (VLBI). Satellite geodesy techniques, such as satellite laser ranging (SLR) and using the Global Positioning System (GPS), determine polar motion and rapid variations of universal time. The satellite geodesy programs used in the IERS allow determination of the time variation of the Earth's gravity field. This variation reflects the evolutions of the Earth's shape and of the distribution of mass in the planet. The programs have also detected changes in the location of the center of mass of the Earth relative to the crust. It is possible to investigate other global phenomena such as the mass redistributions of the atmosphere, oceans, and solid Earth.

Using the above experimental techniques, Universal time and polar motion are available daily with an accuracy of about 50 picoseconds (ps). They are

determined from VLBI astrometric observations with an accuracy of 0.5 milliarcseconds (mas). Celestial pole motion is available every five to seven days at the same level of accuracy. These estimations of accuracy include both short term and long term noise. Sub-daily variations in Universal time and polar motion are also measured on a campaign basis.

In summary, this dynamical model accounts for a number of post-Newtonian perturbations in the motions of the planets, the Moon, and spacecraft. Light propagation is correct to order c^{-2} . The equations of motion of extended celestial bodies are valid to order c^{-4} . Indeed, this dynamical model has been good enough to perform tests of general relativity [28, 51, 52].

So, the authors, believing the Earth is rotating in a fixed universe, use the “the standard space-fixed J2000 coordinate system, which is provided by the International Celestial Reference Frame (ICRF)...a quasi-inertial reference frame defined from the radio positions of 212 extragalactic sources distributed over the entire sky.”⁴

And what are they measuring with respect to Earth? They are specifically measuring:

- “Earth’s rotation” by IERS
- “polar motion” (the motion of the Earth’s rotational axis relative to its crust) by VLBI.⁵
- “celestial motion of the pole (precession/nutation)” by VLBI.
- “time variation of the Earth’s gravity field” (e.g., “evolutions of the Earth’s shape” and “the distribution of mass in the planet”) by IERS
- “changes in the location of the center of mass of the Earth relative to the crust” by IERS

In other words, Anderson’s team did not measure “...mantle elasticity, earth flattening, structure and properties of the core-mantle boundary, rheology of the core,

⁴ Although they do not define or describe what they mean by “quasi-inertial reference frame.” If it’s quasi-inertial, it means there must be some give and take between the “212 extragalactic sources” that does not always balance out to zero.

⁵ Interestingly enough, polar motion is measured “with respect to a reference frame in which the solid Earth is fixed (a so-called *Earth-centered*, *Earth-fixed* or ECEF reference frame). This variation is only a few meters” and one component (out of three) for polar motion is the “called Chandler wobble with a period of about 435 days, an annual oscillation, and an irregular drift in the direction of the 80th meridian west, which has lately been shifted toward the east. The mean displacement far exceeds the magnitude of the wobbles. This can lead to errors in software for Earth observing spacecraft, since analysts may read off a 5-meter circular motion and ignore it, while a 20-meter offset exists, fouling the accuracy of the calculated latitude and longitude. The latter are determined based on the International Terrestrial Reference System, which follows the polar motion.” (Wikipedia: https://en.wikipedia.org/wiki/Polar_motion).

underground water, oceanic variability, and atmospheric variability on time scales of weather or climate,” rather, these are just possible effects of the gravitational and/or inertial perturbations IF one was to interpret the perturbations only from what might happen on or in the Earth.

As noted in the bullet points, the only things the team measured were the half-dozen items that deal only with either gravity or inertial forces in relation to Earth’s mass.

But the “debating trick” that Palm and MacAndrew employ here is to say that Anderson and his team did the following (quoting MacAndrew from Palm):

“Corrections were made for: Earth’s precession, nutation, polar motion, tides, the Moon’s, Sun’s and planets’ gravitational torque, Earth’s mantle elasticity, Earth flattening, structure and properties of the core-mantle boundary, rheology of the core, underground water, oceanic variability, atmospheric variability, evolution of Earth’s shape, and the location of Earth’s centre of mass relative to the crust...”

No, Anderson’s team made no corrections for “Earth’s mantle elasticity, Earth flattening, structure and properties of the core-mantle boundary, rheology of the core, underground water, oceanic variability, atmospheric variability, evolution of Earth’s shape, and the location of Earth’s centre of mass relative to the crust...” since these were just possible results from various outside perturbations on the Earth.

For example, the team recognized that the “earth-rotation vector” might be different than what Earth actually rotated due to perturbations from the moon, sun and the planets. If there was a difference between the expected rotation vector and the actual rotation of the Earth, the difference might be seen in a stretching of the Earth’s mantle, a flattening of the Earth, or affects on the core, underground water, the oceans, the atmosphere, the Earth’s shape or Earth’s center of mass, etc..

But here’s the rub: The things that were, indeed, measured by the team (*e.g.*, the effects of gravitation and inertia on the Earth) are, as MacAndrew himself admitted earlier “...*local* experiments [that] cannot distinguish between various manifestations of acceleration and gravity,” which is true for:

- (1) an ECEF or Earth-Centered, Earth-Fixed (the same frame they use to determine polar motion), or
- (2) the “solar barycentric frame” or
- (3) the “International Celestial Reference Frame (ICRF)...a quasi-inertial reference frame defined from the radio positions of 212 extragalactic sources distributed over the entire sky.”

One can make any of the three frames fixed (inertial) or unfixed (non-inertial). The Anderson team, because they are heliocentrists, chose to make the ICRF its “inertial reference frame,” even though they tried to take the sting off by calling it “quasi-inertial.” The fact is, they could not claim to measure effects on Earth if they did not consider the ICRF as inertial.

In reality, any changes in the relative rotation between Earth and space that were measured by the team could be calculated in any of the three reference frames above. Since Palm and MacAndrew, by their own admission, have no way of distinguishing one frame from the other two, they have no way of pinning everything on the Earth. And considering that the recorded changes in the relative rotation between Earth and space have only been in the microns of seconds, then there isn’t going to be any appreciable change in any case.

So, if we have an ECEF frame from which to judge the Earth’s gravitational perturbations or inertial precessions and nutations, as well as “a stretching of the Earth’s mantle, a flattening of the Earth, or effects on the core, underground water, the oceans, the atmosphere, the Earth’s shape,” how will this translate to a non-inertial ICRF frame (e.g., rotating, accelerating universe)?

Well, since in the geocentric system the Earth is fixed and inertial, then most of the latter effects could appear on Earth as “a stretching of the Earth’s mantle, a flattening of the Earth, or effects on the core, underground water, the oceans, the atmosphere, the Earth’s shape,” precisely as they would appear on a rotating Earth.

As for the former (gravity perturbations and inertial precessions and nutations caused by angular momentum), they will appear as precessions and nutations in the universe at large.

In fact, it is the universe’s precessions and nutations that will cause deformities on and in the Earth, while the Earth itself stays fixed with respect to the universe as they share a center of mass. In such cases, all things will abide by Newton’s 3rd law: “for any action there is an equal and opposite reaction.”

In either case, all is accounted for whether we use the ECEF or the ICRF frames, and thus these factors can be neutralized when analyzing what is really happening to cause Pioneer 10 to have “anomalous accelerations.”

MacAndrew: Geocentrists would have us believe that the daily Doppler modulation was caused by variations in the velocity of the source (the spacecraft) and not by the Earth’s rotation which they claim does not exist. In that case, shouldn’t they explain why, according to them, the velocity of the Pioneer spacecraft, freely flying through

space and several billion kilometres from Earth, cycled with a period of exactly one sidereal day?

R. Sungenis: All we need to add now is that Palm and MacAndrew didn't notice an important caveat to their thesis: the authors of the very paper they are using to claim there is some variation to the Earth's rotation or other earthly factors that would cause the "anomalous acceleration" to the Pioneer spacecraft, *don't agree with them*. The authors say *it is precisely something other than what is occurring on Earth. The anomalous acceleration is attributed to what is occurring on the Pioneer 10 spacecraft*. So all Palm's and MacAndrew's challenge requiring us to show some effects from a rotating universe on Pioneer 10 is nothing but a straw man. The very authors they give us say it has nothing to do with either the Earth or the universe, but only with a possible heat factor that Pioneer 10 was not built to withstand or even a simple garden variety "gas leak."

In fact, if there is anyone promoting theories that try to tie in the universe as explaining the Pioneer 10 anomalous acceleration it is the modern scientists of the world who, in over a dozen proposals I listed from Anderson's and Liang's, *et al* paper, attribute the anomaly to effects from universal gravitation.

Palm and MacAndrew: Can they explain why the details of the supposed Pioneer velocity cycle reflected all the subtle variations in the velocity of the ground station such as Earth's precession, nutation, polar motion, and so on?

R. Sungenis: Not to beat a dead horse, but I would have hoped after explaining the geocentric system to these gentlemen for the last decade that they would have caught on to the fact that the general principle of relativity excludes them from attributing Pioneer 10's velocity cycle only to Earth's precession, nutation and polar motion, and prohibits them from excluding the reciprocal precessions and nutations created by a universe in daily sidereal rotation on a 1AU cam, and a lateral yearly rotation of the ecliptic pole around the north celestial pole on the same 1AU cam, as well as traveling up and down the ecliptic plane at the same time. Our animations show quite clearly how this all works. After all, does not MacAndrew himself admit at the beginning of this paper:

Although it is true that within [General Relativity], *local* experiments cannot distinguish between various manifestations of acceleration and gravity...

Although MacAndrew has, in the past, tried to distinguish local from non-local events in distinguishing between acceleration and gravity, this is not the way either the general principle of relativity or the General Relativity theory has understood it. In other words, the correlation between gravity and acceleration (*e.g.*, inertial forces such as centrifugal and Coriolis) is applicable all over the universe, not just in our local area. This means

that a rotating universe as described above will create the accelerated inertial forces (centrifugal, Coriolis, Euler) that mimic gravity—the very gravity that causes the rotating Earth in the heliocentric system to produce its precessions and nutations with respect to a fixed universe.

Palm: Can they give us one good reason to conclude that the daily Doppler modulation was caused by daily changes in the velocity of the spacecraft rather than by earth's rotation?

R. Sungenis: Again, yes we can, since the very authors Palm cites state that the Earth's rotation that they believe as heliocentrists had nothing to do with the anomalous accelerations of the Pioneer 10 spacecraft. They state quite clearly that, although with some reservations, the "Doppler modulation" was caused by a heat problem occurring on the Pioneer 10 spacecraft and not from something either on Earth or in the universe.

Palm: Sungenis's "answer" to this challenge in his article "There Goes the Sun..." was to cut and paste seven pages of *outdated* and *irrelevant* material from *Galileo Was Wrong* (pp. 351-358 of volume 2 in the 11th edition.). I emphasize *outdated* because Sungenis's copy-pasted material only extends to 2004, whereas MacAndrew cited a source from 2012 that lays out the explanation of the Pioneer anomaly. I emphasize *irrelevant* for three reasons: First, MacAndrew's challenge didn't rely on the anomaly itself, but rather all of the corrections for motion that had to be made in order precisely to track the anomaly. Without correcting for all of these motions we wouldn't be getting intelligible data from the spacecraft at all. The anomaly is irrelevant to this discussion, but that's where Sungenis focused all of his attention.

R. Sungenis: As we already saw in reading Anderson's and Liang's, *et al*, paper, they didn't "correct" for most of the items they listed; and also admitted they could have added at least ninety more parameters. Rather, they said that if there were any additional oscillations in the Doppler, they would attribute them to one or all of these earthly effects, all of which, as we noted, can also have universal causes, not just earthly ones. The problem here is that neither Palm nor MacAndrew seem to have read the paper they submitted very carefully. They just assumed various things, and didn't even stop to think that a heat problem on Pioneer 10 has nothing to do with Earth in the first place. Yet these are the same people who accuse me of...

"...misdirection. In many instances he appears to give a fulsome answer, but a closer look shows that he's failed to engage his opponent's argument at all. His frequent *modus operandi* is to overwhelm the reader with copious but irrelevant verbiage, in the hopes that the reader will confuse quantity of words with intellectual substance."

Palm: Second, in the copy-pasted verbiage Sungenis doesn't give even "one good reason" that we should conclude that the daily motions with regard to the Pioneers are motions of the spacecraft rather than the Earth. He prefers to hide behind the Pioneer anomaly as if its mere existence absolves him from having to answer MacAndrew's perfectly reasonable questions.

R. Sungenis: As we can see from this present response, whatever Palm didn't like in the previous response has been made clearer in this present response. The "one good reason" that "we should conclude that the daily motions with regard to the Pioneers are motions of the spacecraft rather than the Earth," is the very one stated by the author Palm chose to refute me, that is, a heat problem on Pioneer 10 that has nothing to do with the Earth.

Palm: And third, the Pioneer anomaly was explained in 2012, as Dr. MacAndrew points out, "with perfectly conventional physics". Now that the anomaly itself is explained, Sungenis has nowhere else to go. He prefers to hide behind an avalanche of outdated and irrelevant verbiage. He's hoping the reader won't notice.

R. Sungenis: Again, notice how Palm is always judging my motives, and makes them as sinister as he can. For him, I'm hiding from the truth; I have nowhere to turn; I hope the audience doesn't notice my ploy and thus I just spout nonsense. But it is just the opposite. First, we already saw that MacAndrew's claim to "perfectly conventional physics" was not only highly modified by the authors themselves who couldn't agree on the precise cause, but was also drowned out by the plethora of physics theories that have been used to interpret the Pioneer 10 anomaly. These numerous and contradictory theories are alive and well, and it only took something as remote as Pioneer 10 to bring them all to the surface. Every physicist who has been touting a new theory of physics for the past four decades tried to answer the Pioneer 10 anomaly within their new theory. It was nothing but confusion upon confusion, and it showed quite clearly the deplorable condition of modern cosmological physics. Nobody knows what the hell they are doing.

Palm: Well, we noticed. Here's Dr. MacAndrew's challenge again:

Geocentrists would have us believe that the daily Doppler modulation was caused by variations in the velocity of the source (the spacecraft) and not by the Earth's rotation which they claim does not exist. In that case, shouldn't they explain why, according to them, the velocity of the Pioneer spacecraft, freely flying through space and several billion kilometres from Earth, cycled with a period of exactly one sidereal day? Can they explain why the details of the supposed Pioneer velocity cycle reflected all the subtle variations in the velocity of the ground station such as Earth's precession, nutation, polar motion, and so on? Can they give us one good reason to conclude that the daily

Doppler modulation was caused by daily changes in the velocity of the spacecraft rather than by earth's rotation?

Obviously, Robert Sungenis cannot give even one good reason.

R. Sungenis: Not only have I given “one good reason,” I have given several, and at the top of the list is the incompetence of my opponents who, by the looks of it, didn't carefully read the paper they submitted as evidence for their case against geocentrism.

Palm: Now, dear reader, one can easily anticipate that, if Sungenis “answers” this article he will point out other alleged anomalies in various spacecraft trajectories detected since 2012. In doing so he will hope that you fail to notice that, as interesting as those anomalies may be, they have nothing to do with the Pioneer anomaly itself, which has been solved. He will hope that you don't notice that said anomalies have absolutely nothing to do with the substance of the challenge. And he will hope that you fail to notice that in the midst of all this obfuscation he will still have yet to give even one good reason why the numerous corrections necessary for daily Doppler modulations between the Earth and the Pioneer spacecraft could plausibly be attributed to motion of the spacecraft themselves, rather than to motion of the Earth.

R. Sungenis: Notice again how Palm, in his insidious attack on my motives and methods in order to score points with the audience, has resorted to his crystal ball antics of predicting what my answer will be. Of course, my answer includes nothing of what he predicted. But will Palm apologize for falsely accusing me? Not on your life. He has never once apologized to me for anything he has done.

Palm: Given that strict Geocentrism is no more than an elaborate exercise in scientific special pleading, gummed together with conspiracy theories, it is unsurprising that, yet again, its proponents have to rely so heavily on debater's tricks like misdirection and obfuscation rather than answering basic questions.

R. Sungenis: Uh huh.

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